

Granitic magma processes during the Cretaceous flare-ups on the continental margin of East Asia: An Example from Kajishima, southwest Japan.

DR. KAZUYA SHIMOOKA¹, MITSUHIRO NAGATA²,
YASUHIRO OGITA^{3,4}, TOSHIRO TAKAHASHI⁵,
KENICHIRO TANI⁶, MOTOHIRO TSUBOI¹ AND SATOSHI
SAITO⁷

¹Kwansei Gakuin University

²Nihon University

³Kumamoto University

⁴Japan Atomic Energy Agency

⁵Department of Geology, Niigata University

⁶National Museum of Nature and Science

⁷Ehime University

The Cretaceous – Paleogene plutonic rocks in southwest Japan are a part of huge igneous belts that developed along the continental margin of East Asia during the Cretaceous magmatic flare-up event. In Kajishima, one of the uninhabited islands in central area of Seto Inland Sea of southwest Japan, various types of Cretaceous gabbroic rocks associated with granitic dykes are well exposed. Because gabbroic rocks are likely formed related to mantle activity, petrological investigation on genetic link between gabbroic rocks and granitic rocks in Kajishima will shed new lights on the crust-mantle process and Cretaceous flare-up mechanisms. In this study, we present field, petrographic, whole-rock chemical composition, and zircon Hf isotopic data of the plutonic rocks in Kajishima to investigate the granitic magma process during the Cretaceous magmatic flare-up event. In outcrops, granitic rocks in Kajishima occur as dykes intruding into host gabbroic rocks. Small scale (cm size) granitic veins/networks also occur within gabbroic rocks. The granitic networks in gabbroic rocks show gradual contact with host gabbroic rocks. They connect each other and form pools and dykes implying accumulation of granitic interstitial melt in solidifying gabbroic magma. Quartz-bearing partial melting textures are observed in granitic rocks. The gabbroic rocks locally contain poikilitic hornblende hosting subhedral to anhedral pyroxene and plagioclase and olivine with corroded shapes. Zircon Hf isotopic compositions of granitic rocks show similar range with those of gabbroic rocks. Identical zircon Hf isotopic signatures between granitic rocks and gabbroic rocks in Kajishima strongly suggests their genetic relationship. Field occurrence and microscopic observations imply that the granitic interstitial melts, formed through extreme crystal fractionation of gabbroic magma or partial melting of gabbroic rocks, join together and form granitic rocks in Kajishima. We propose a two-stage model: Stage 1, tonalite generation from gabbro remelting; Stage 2, granite formation from tonalite remelting. Modeling results support residual plagioclase, pyroxenes, and magnetite in Stage 1, and residual plagioclase, quartz, biotite,

and magnetite in Stage 2. Therefore, Kajishima records crustal differentiation through partial melting and remelting of mafic lower crust at an active continental margin, such as the Eurasian continental margin during flare-ups.